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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/057,674	01/24/2002	Jong H. Hwang	AM-2602.C1	1101
32588 7590 05/28/2004				
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050				
EXAMINER DUDA, KATHLEEN				
ART UNIT		PAPER NUMBER		
1756				

DATE MAILED 05/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/057,674

Applicant(s)

HWANG ET AL

Examiner

Kathleen Duda

Art Unit

1756

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 16 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-11, 13-16, 18-25, 27 and 29-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 19-25, 27 and 32 is/are allowed.
- 6) ☒ Claim(s) 1, 10, 11 and 13-16 is/are rejected.
- 7) ☒ Claim(s) 2-9, 18 and 29-31 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/55/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. Claims 1-11, 13-16, 18-25, 27 and 29-32 are pending in this application.

#### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 29-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 29-32 are indefinite in reciting, "said etchant gas" when etchant gases are referred to in more than one step in the independent claims.

#### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for

purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 10, 11 and 13-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Ye (US Patent 6,143,476).

Ye discloses a method of high temperature etching of materials such as copper, platinum, iridium, ruthenium and tungsten. Substrate 212 is a 1000 angstrom dielectric layer of silicon dioxide overlying a silicon wafer (not shown). A barrier layer 214 of tantalum nitride of approximately 500 angstroms thickness formed over the substrate 212. A conductive layer 216 (corresponding to the applicant's noble metal layer) of approximately 8000 angstroms is formed over the barrier layer 214, followed by a 500 angstrom layer 218 of tantalum nitride (corresponding to the applicant's inorganic protective layer in claim 1, 14 and inorganic first mask layer in claim 22). Ye teaches that conductive materials such as platinum, iridium and ruthenium may be used instead of copper (column 6, lines 30-35 and column 10, lines 54-56). Organic masking layer 220 and silicon dioxide layer 222 (corresponding to the applicant's inorganic mask layer in claims 1, 13, 14, 19 and inorganic second mask layer in claim 22) is then deposited to a thickness of about 1000 angstroms, followed by patterned photoresist layer 224 (column 8, lines 23-46). The pattern in the photoresist is transferred through layer 222 and layer 220 (applicant's step b). The photoresist layer 224 is then removed (step c). Optionally layer 222 may be

removed also (step g). However, if the thickness of the silicon dioxide layer is properly designed, this layer will be automatically removed during the patterning of feature layer 216. Barrier layer 218 and conductive layer 216 are then etched (steps d, e, f and h) using a feed gas of HCl, N<sub>2</sub> and BCl<sub>3</sub> at a temperature of about 250°C. Layer 220 is then removed (step g). Other materials which may be used for antireflective/barrier layers 214 and 218 include silicon oxynitride, tantalum, titanium nitride, tungsten titanate and tungsten nitride. See column 8, line 23 through column 10, line 56.

Applicant argues that Ye teaches a mask which includes inorganic and organic mask layers. Applicant argues that the inorganic layer in the claimed process is directly on the substrate. In the claims under rejection, there is no recitation that the inorganic layer is directly on the substrate. Applicant argues that the language has been amended so that only an inorganic mask layer is present. The claims use open language and do not preclude a second mask layer which comprises an organic mask layer.

Applicant argues that the claim language does not recite an organic-based mask layer in direct contact with a noble metal layer. Open language ("comprising") language is used which does not preclude such a layer.

***Response to Amendment***

6. The art rejections using the Yokoyama, Kim and Kornblit references have been removed because these references teach the use of oxygen in the plasma. The claims have been amended to recite that the plasma "consists essentially of" gases including halogen-containing gas and a gas which is a noble gas, nitrogen or a mixture thereof. This recitation would not teach or suggest the use of oxygen in the plasma.

The art rejections using Hong and Anderson have been removed because the claims recite dry etching processes which would preclude the use of wet etching as recited in Hong.

***Allowable Subject Matter***

7. Claims 19-25, 27 and 32 are allowed. The art rejections have been overcome for the reasons given above.


8. Claims 2-9, 18 and 29-31 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

**Conclusion**

9. Any inquiry concerning this communication should be directed to Examiner K. Duda at (571) 272-1383. Official FAX communications should be sent to (703) 872-9306.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff, can be reached at 571-272-1385.

Information regarding the status of an application may be obtained from the Patent Application Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Kathleen Duda  
Primary Examiner  
Art Unit 1756